

This listing of claims will replace all prior versions, and listings, of claims in the application:

LISTING OF THE CLAIMS

1. (Currently Amended) A method of forming an interconnect structure comprising the steps of:

providing a lower metal wiring layer having first metal lines located within a lower low-k dielectric;

depositing an upper low-k dielectric atop said lower metal wiring layer;

etching at least one portion of said upper low-k dielectric to provide at least one via to said first metal lines;

forming rigid dielectric sidewall spacers in said at least one via of said upper low-k dielectric, said dielectric sidewall spacers are of a material selected from the group consisting of SiCH₃, SiCOH, SiC and SiO₂; and

forming second metal lines in said at least one portion of said upper low-k dielectric.

2. (Original) The method of Claim 1 wherein said upper low-k dielectric and said lower low-k dielectric comprise materials having a dielectric constant ranging from about 1.0 to about 3.5.

3. (Original) The method of Claim 1 wherein said upper low-k dielectric and said lower low-k dielectric comprise low-k polymers or low-k carbon doped oxides.

4. (Canceled)

5. (Original) The method of Claim 4 wherein said forming rigid dielectric sidewall spacers further comprises:
depositing a conformal rigid dielectric liner atop said upper low-k dielectric and within said at least one via; and

etching horizontal surfaces of said conformal rigid dielectric liner to form said rigid dielectric spacers positioned on vertical sidewalls of said at least one via.

6. (Original) The method of Claim 5 wherein depositing a conformal rigid dielectric liner further comprises physical vapor deposition (PVD), plasma enhanced chemical vapor deposition (PECVD), high density plasma chemical vapor deposition (HDPCVD), or low pressure chemical vapor deposition (LPCVD).

7. (Original) The method of Claim 6 wherein said conformal rigid dielectric liner has a thickness ranging from about 10 nm to about 100 nm.

8. (Original) The method of Claim 7 wherein said etching horizontal surfaces of said conformal rigid dielectric liner further comprises an anisotropic etch process.

9. (Currently amended) The method of Claim 8 wherein said lower metal wiring layer further comprises a rigid insulating layer deposited atop said lower low-k dielectric, said rigid insulating layer material selected from the group consisting of SiC, SiO₂, and Si₃N₄.

10. (Currently amended) A method of forming an interconnect structure comprising the steps of:

providing a lower metal wiring level having first metal lines positioned within a lower low-k dielectric;

depositing a mechanically rigid dielectric layer atop said lower metal wiring level;

forming at least one via through said mechanically rigid dielectric layer to a portion of said first metal lines; and

forming an upper metal wiring level having second metal lines positioned within a upper low-k dielectric, said second metal lines being electrically connected to said first metal lines through said via, wherein said via comprises a metal having a coefficient of thermal expansion that substantially matches said mechanically rigid dielectric layer, said mechanically rigid dielectric layer separating said upper metal wiring level from said lower metal wiring level.

11. (Original) The method of Claim 10 wherein said mechanically rigid dielectric comprises a coefficient of thermal expansion ranging from about 0.1 ppm/°C to about 5.0 ppm/°C.

12. (Original) The method of Claim 10 wherein said mechanically rigid dielectric comprises SiO₂, SiCOH, or doped silicate glass.

13. (Original) The method of Claim 10 wherein said mechanically rigid dielectric has a thickness ranging from about 100 nm to about 1000 nm.

14. (Original) The method of Claim 10 wherein said upper low-k dielectric and said lower low-k dielectric comprise materials having a dielectric constant of less than about 3.5.

15. (Original) The method of Claim 14 wherein said upper low-k dielectric and said lower low-k dielectric comprise low-k polymers or low-k carbon doped oxides.

16. (Original) The method of Claim 15 wherein said low-k polymer is a b-staged polymer comprising about 95% carbon.

17. (Original) The method of Claim 15 wherein said low-k carbon doped oxide is SiCOH.

18. (Original) The method of Claim 10 wherein said second metal lines, said first metal lines or a combination of said second metal lines and said first metal lines comprise copper, aluminum, silver, gold or alloys thereof.

19. (Withdrawn) An interconnect structure comprising:

a lower metal wiring level comprising first metal lines positioned within a lower low-k dielectric;

an upper metal wiring level atop said lower metal wiring level, said upper metal wiring level comprising second metal lines positioned within an upper low-k dielectric;

and a plurality of vias through a portion of said upper low-k dielectric electrically connecting said lower metal wiring level and said upper metal wiring level, where said plurality of vias comprise a set of rigid dielectric sidewall spacers.

20. (Withdrawn) The interconnect structure of Claim 19 wherein said set of rigid dielectric sidewall spacers comprise SiCH, SiC, SiNH, SiN, or SiO₂.

21. (Withdrawn) The interconnect structure of Claim 20 wherein each of said set of rigid dielectric sidewall spacers have a thickness ranging from about 10 nm to about 100 nm.

22. (Withdrawn) An interconnect structure comprising:

a lower metal wiring level comprising first metal lines positioned within a lower low-k dielectric;

a mechanically rigid dielectric positioned on said lower metal wiring level, said mechanically rigid dielectric comprising a plurality of metal vias; and

an upper metal wiring level atop said mechanically rigid dielectric, said upper metal wiring level comprising second metal lines positioned within an upper low-k dielectric, where said plurality of metal vias electrically connect said lower metal wiring level and said upper metal wiring level.

23. (Withdrawn) The interconnect structure of Claim 22 wherein said mechanically rigid dielectric comprises SiO_2 , SiCOH, or doped silicate glass.

24. (Withdrawn) The interconnect structure of Claim 22 wherein said plurality of metal vias has a coefficient of thermal expansion matched to said mechanically rigid dielectric.